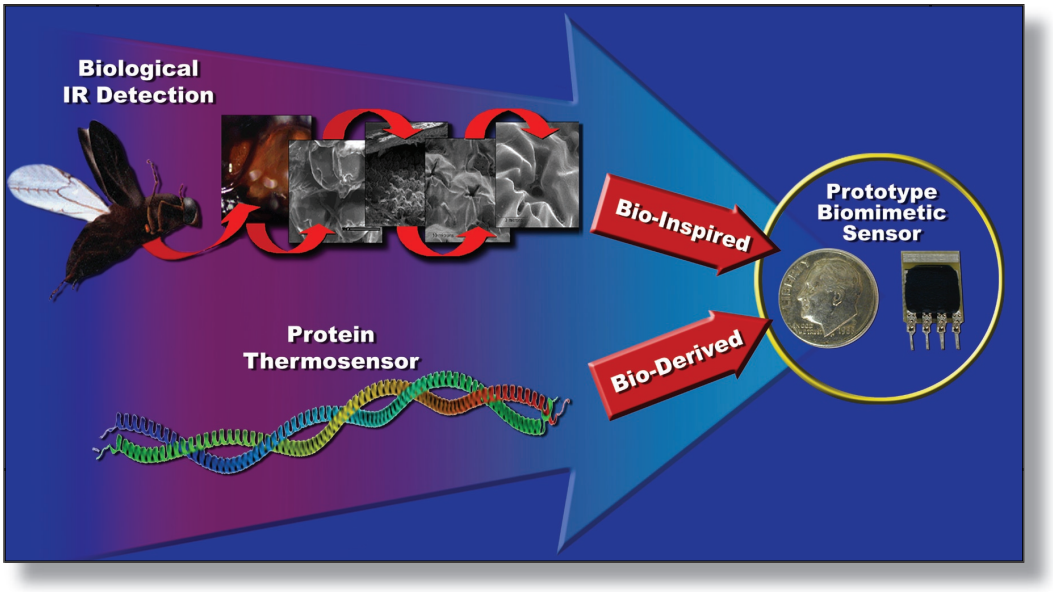
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

TECHNOLOGIES IMITATING LIFE COULD ENHANCE PERFORMANCE AND LOWER COSTS OF CRITICAL DEFENSE TECHNOLOGIES



Continued research in biotechnology and biomimetics could lead to the development of dynamic materials, devices, and processes that directly support the warfighter. Advancements in the understanding of the natural world benefit science, provide opportunities for innovative commercial applications never before possible, and could heighten the performance of vitally important military technologies while reducing costs.

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Accomplishment

Scientists in the Materials and Manufacturing Directorate's Survivability and Sensor Materials Division, working with the Air Force Office of Scientific Research (AFOSR) and researchers at various universities, made significant advancements in the areas of biotechnology and biomimetics, which means literally to imitate life. Materials researchers continue to be intrigued by various organisms' ability to sense infrared (IR) radiation using the readily available elements carbon, hydrogen, oxygen, and nitrogen.

Their efforts support the Air Force goal of producing hybrid materials with properties superior to those made of either entirely synthetic or biological alternatives. This research increases the understanding of living creatures possessing unique properties and abilities that could someday enhance the performance and affordability of critical defense technologies.

Background

Directorate scientists have advanced the understanding of how certain biological organisms sense electromagnetic radiation outside the visible-light region. This phenomenon is important to the Air Force due to the proliferation and reliance upon sensors and detection systems that operate in the IR region of the electromagnetic spectrum. The quest for understanding this phenomenon escalated even further as a result of the extreme sensitivity reported in biological IR/thermal detection and because biology achieves this without cryogenics.

In a practical sense, biomimetics refers to interdisciplinary efforts to understand biological principles, then applying them to improve existing technologies or create new ones. Technologies imitating life could have a profound impact on national defense.

Investigations have yielded critical insights and helped scientists progress toward the development of bio-inspired and bio-derived technologies.

The biological processes associated with biotechnology and biomimetics are enormously complex and multistep, and they often operate non-linearly. Also, the molecules involved in these processes are sometimes fragile, and integration with other systems can be problematic.

Despite these drawbacks, the research is very promising. Biotechnology and biomimetics frequently use composite materials that provide combinations of properties not achievable by any single material. This allows researchers to detect minute differences such as distinguishing nearly identical compounds and different inorganic crystal faces.

Materials and Manufacturing
Emerging Technologies

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-06)